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Make full use of two kinds of resources and two markets to protect our food security and raise farmers' income

----Taking soybeans as an example

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Abstract

Taking soybeans as an example, this paper shows that better utilization of both domestic and international resources and markets will improve farmers' income. Moderately adjusting the agricultural structure in China and making better use of Chinese farmers' comparative advantage is the key. The pre-requisite for agriculture in China shows that the benefits from improving the profit of unit land are higher than that from the profit of unit labor.

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Keywords: Soybean; Labour-intensive product; Land-intensive product; Resource Allocation; Cost and Revenue; International Trade;

1. Introduction

The international price of grain has increased by on average 83% since mid-2006. In March 2008, the wheat, soybean, corn and rice prices in international markets rose by 137.5%, 79.2%, 36.4% and 66.6%, respectively, compared with March 2007. The price of rice and wheat reached their highest level in 19 years, and 28 years respectively.

In 2008, during the G8 Summit, a number of leaders from developed countries argued that China's grain import led to an upward spiral of global grain prices. Statistics, however, tell a different story: China has been a net exporter of both rice and corn. Before 2003, the amount of wheat exported exceeded the amount imported. Only for two years, e.g., 2004 and 2005, imports exceeded exports. In 2006, China restored the position as a net exporter of wheat. In 2007, China exported 2.337 million tons of wheat while the import reached a mere 83.4 thousand. As a result, the observed fluctuations in the prices of corn, rice and wheat have basically no relationship with China.

Different from the major grain net export countries, China dramatically increased its imports of soybeans from approximately one thousand tons in 1985 to 37 million tons in 2008, thus increasing its imports by more than 30

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thousand times in 12 years. China's large imports of soybeans markedly affected the international price of soybean, with the price increasing from 197.59 USD/ton in Feb., 2005 to 554.15 USD/ton in July 2008.

2. The domestic and international markets have influenced the soybean trade in China

2.1 The price difference between the domestic market and foreign market is the direct reason for the soybean import in China.

Table 1 The Production and Import of Soybeans in China

	Import (10 thousands tones)	Production (10 thousands tones)	Acreage (1000 hectares)	Total Demand	<i>The Prop. of domestic prod.</i>
1991	0	1247	7041	1247	100.0%
1992	12	1252	7221	1264	99.1%
1993	10	1950	9454	1960	99.5%
1994	5	2096	9222	2101	99.8%
1995	29	1788	8127	1817	98.4%
1996	111	1790	7471	1901	94.2%
1997	280	1876	8346	2156	87.0%
1998	320	2001	8500	2321	86.2%
1999	432	1894	7962	2326	81.4%
2000	1042	2010	9307	3052	65.9%
2001	1394	2053	9482	3447	59.6%
2002	1131	2241	8720	3372	66.5%
2003	2074	2128	9313	4202	50.6%
2004	2023	2232	9589	4255	52.5%
2005	2659	2158	9591	4817	44.8%
2006	2824	2004	9304	4828	41.5%
2007	3082	1720	8754	4802	35.8%
2008	3744	----	----	----	----

Source: The land and import data are from *Statistical Yearbook of China's Rural Areas 2009*, p.236. Production data are from *China Statistical Abstract 2009*, p.127. The import of 2008 is from <http://comtrade.un.org>

From Table 1, it is clear that imports of soybeans in China grew rapidly from middle to late 1990s. Imports exceeded 1 million tons for the first time in 1996. However, during the same period, the production of domestic soybeans, their planting areas and aggregate demand did not change much. The dramatic change in imports was mainly related to the price difference between the domestic and international markets.

Figure1 shows the international comparison of the price changes of soybean suppliers. It indicates that before 1995, the soybean price of Chinese suppliers was lower than the world's average price. After 1996, the soybean price soared in China, and the domestic price was much higher than the world's average price. The price of suppliers is the first-hand price of agricultural products from the production process to the circulation field, and is also the origin of the market price of agricultural products. The relatively high price of suppliers is bound to increase the market price of agricultural products. Due to the obvious price difference gap between domestic and foreign soybeans, and considering the economic benefits, China has imported lots of soybeans from the world market since 1996.

Soybean represents the import volume of soybeans, shrimp represents the export volume of shrimp, and land represents the arable land areas of soybeans. From the results, we see that the export of shrimp has a significant positive effect on the import of soybeans and the impact of change of soybean's arable land area on the import is the same as expected, i.e. negative. This suggests, in turn, that the import of soybeans in China increased dramatically as a result of increasing demand of aquaculture feedstuff.

The shrimp export of China is mainly in America, Japan and Korea. In 2008, the shrimp volume imported by these countries accounted for 46.5% of China's total shrimp trade. The quantity exported to America rose from 20.8 thousand tons in 2005 to 49.7 thousand tons in 2006, up by 2.39 times. In the same year, the shrimp import of Japan and Korea rose by 1.78 times and 1.72 times, respectively. It's in this period, the international price of soybean increased rapidly.

Table 2 Exports Distribution of Chinese Shrimp (Thousand tons)

	<i>World</i>	<i>Japan</i>	<i>United States</i>	<i>Korea</i>	<i>The Prop. of three countries</i>
2004	102	12.2	15.1	11.1	37.6%
2005	129	14.7	20.8	9.5	34.9%
2006	201	26.3	49.7	16.4	46.0%
2007	197	30.4	33.8	30	47.7%
2008	183	24.3	39.3	21.5	46.5%

Source: UN COMTRADE Database (<http://comtrade.un.org/db/>), Commodity Code HS.16052。

Economic integration has strengthened the interdependency among countries. On one hand, China makes full use of its relatively cheap agricultural products such as soybeans to develop its domestic aquaculture. China produces and exports aquaculture products with higher value-added to increase people's income. On the other hand, countries that produce soybeans can not only get benefits from the orders of China, but also enjoy various kinds of seafood products with high quality and low price. Through international trade, the win-win situation of both suppliers and sellers in two markets is formed.

3. The Influence of Domestic and International Resources on the Soybean Trade of China

3.1 Importing soybeans and land resources importing

Due to the high population density in China, the limited land areas available, a growing population and the urbanization progress, the land area in China decreased from 1.3 million hectares in 1996 to 1.217 million hectares in 2007. Limited availability of arable land is the major barriers for the agricultural development in China. Apart from land, the inputs of grain production mainly include capital and labor. To get a better grip of the prevailing situation, we continue by studying the influence of different inputs on the major grain plants and soybeans. The model uses total production of rice, wheat and corn is the dependent variable (GOP). Arable land area is the independent variable. The specific indications are as follows:

Land input arable land area, with the symbol of GAP. Capital input: the total grain cost per mu, including production cost (GCP) and land cost (GCA). The production cost indicates the cost of materials, service expenses and labor cost. The land cost mainly consists of the rent for circulating land as well as depreciation and rent of independent-managed land. Labor input: labour consumption per mu, with the symbol of ALM.

There is a time lag of the cost influence on production. Suppose the lag is one period, we study the control variables of influential factors for capital input (GCP (-1) and GCA (-1)). Because the factors of price and subsidy to some extent influence the agricultural production of the next period, we take the average sales price of grain (APS) and subsidy income per mu (ARS) as the control variables and substitute them into the model. In order to reduce the impact of heteroscedasticity, logarithmics treatment has been done to each variable. The model is given in equation (2).Table 3 shows the regression results.

Due to the high population density in China, the limited land areas available, the population growth of domestic population and the urbanization progress, the land area in China decreased from 1.3 million hectares in 1996 to 1.217 million hectares in 2007. The land resources are the major barriers for the agricultural development in China. Apart from land, the inputs of grain production mainly include capital and labor as well. Here, we study the influence of different inputs on the major grain plants and soybeans.

Take the total production of rice, wheat and corn as the dependent variable, shown by the symbol GOP. We take the indications closely related to inputs as the independent variable, and substitute them into the model to study. The specific indications are as follows:

Land input: arable land area, with the symbol of GAP.

Capital input: the total grain cost per mu, mainly including production cost (GCP) and land cost (GCA). The production cost indicates the cost of materials, service expenses and labor cost. The land cost mainly indicates the rent of circulating land as well as depreciation and rent of independent-managed land.

Labor input: labour consumption per mu, with the symbol of ALM.

There is time lag of the cost influence on production. Suppose the lag is one period, i.e. we study the control variables of influential factors for capital input (GCP (-1)) and GCA (-1)). Because the factors of price and subsidy, to some extent, influence the agricultural production of the next period, this paper took the average sales price of grain (APS) and subsidy income per mu (ARS) as the control variables and substituted them into the model to be studied. In order to decrease the impact of heteroscedasticity, logarithmics treatment has been done to each variable. The expression of the model is as follows:

$$\text{Log(GOP)}_{it} = \alpha + \beta_1 \cdot \log(\text{GAP})_{i(t-1)} + \beta_2 \cdot \log(\text{GCP})_{i(t-1)} + \beta_3 \cdot \log(\text{GCA})_{i(t-1)} + \beta_4 \cdot \log(\text{APS})_{i(t-1)} + \beta_5 \cdot \log(\text{ALM})_{it} + \varepsilon_{it} \quad (2)$$

Table 3 The Analysis of the Major Factors affecting Domestic Food Product

	<i>Soybean</i>	<i>Rice</i>	<i>Wheat</i>	<i>Corn</i>
α_0	-4.4967** (-2.9014)	-3.1065 *** (-4.1823)	-1.326 (-0.6369)	-1.9821 (-0.5686)
$\log(\text{GAP})$	1.1487*** (6.8739)	1.2056 *** (15.7844)	1.0757 *** (4.7279)	1.1518 ** (3.4026)
$\log(\text{GCP})_{t-1}$	0.1068 (0.8400)	0.0966 *** (3.6652)	-0.1861 * (-2.5327)	0.1063 (0.5675)
$\log(\text{GCA})_{t-1}$	0.0464 (0.5911)	0.0147 (0.7464)	0.1243 * (2.3647)	-0.1234 (-1.8009)
$\log(\text{APS})_{t-1}$	0.0797 (1.1388)	-0.0091 (-0.9805)	0.1918 * (2.5161)	0.0909 (0.8331)
$\log(\text{ALM})$	0.1393 (1.4498)	-0.0265 (-1.3241)	-0.2422 * (-2.3189)	-0.3072 * (-2.776)
<i>Adjusted R²</i>	0.9617	0.9548	0.769	0.9007
<i>F Statistic</i>	38.7064	81.2968	13.6502	35.4838
<i>P -Value</i>	0.0062	0.0000	0.0000	0.0000

Note: * indicated that 10% level of significance to accepts the null hypothesis; **indicated that 5% level of significance to accepts the null hypothesis; ***indicated that 1% level of significance to accepts the null hypothesis. The data in parentheses is T statistics.

Source: China Statistical Yearbook 2008, *Compilation of the National Agricultural Costs and Returns (2003 and 2009 version)*, China’s Agricultural Development Report 2007.

Table 4 summaries the degree of impact to each input. The symbol of √ is used to indicate the degree of impact: √ means slightly impacted, √√ represents moderate and √√√ is significant effect.

Table 4 The Degree of Different Input Factors Impact on the Production

	<i>Rice</i>	<i>Wheat</i>	<i>Corn</i>	<i>Soybean</i>
<i>Land</i>	√√√	√√√	√	√√√
<i>Capital</i>	√√√	√		
<i>Labor</i>		√	√	

All three inputs influence grain production to various degrees. Land input is the most significant factor, which is determined by the particularity of agricultural production.

In terms of segmentation, the factor of capital input is more important for the production of grain. Although compared with other grain, rice is the labor-intensive product. In 2008, the labor consumption of rice was 9.06 (day/mu), which is 1.48 times of wheat (6.10 day/mu), 1.15 times of corn (7.9 day/mu) and 2.33 times of soybeans (3.89 day/mu), respectively. However, the cost of rice production per mu was as high as ¥665.1, which is much higher than the costs of wheat (¥498.55), corn (¥523.45) and soybean (¥347.99). Therefore, the factor of capital input has significant influence on grain production. In wheat production, apart from land, the primary factor, the impact of capital and labor on production is similar. Contrary to rice, in corn production, labor has more influence than capital input. Compared with various major grains, the unique significant factor for soybeans is arable land. In addition, planting soybeans needs relatively lower labor input.

Although China's total arable land area ranks fourth in the world, the arable land per capita is less than half of the world's average level, and the rank drops to the 126th. In USA, the arable land area accounts for 19.04% of the country area, the proportion of China is only 11.09%. There were 4.76 million tractors per one million hectares in USA in 2003, compared to only 990 thousands in China. Among the cost of soybean production, the proportion of mechanization was 21.7% and less than 0.7% was for labor. The higher mechanization made the soybeans' yield per hectare in USA 0.63 tons higher than in China. The difference was almost 1.4 times.

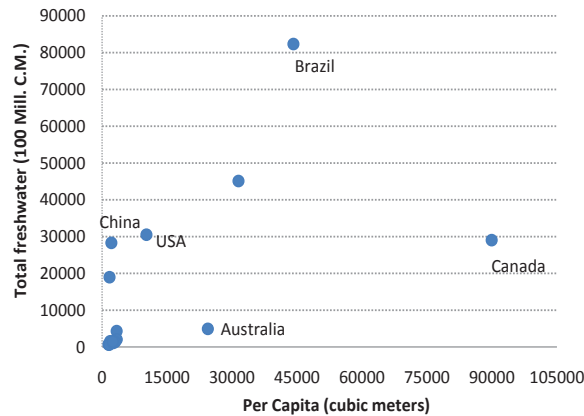
Compared with the United States, there is shortage of available arable land in China, but with abundant and relatively low-cost labor resources. Thus, China should decrease the production of land-intensive or machine-intensive crops, and turn to increase the production of labor-intensive crops. The required degree of mechanization for producing soybeans is higher than the requirement of producing other crops, and it is difficult to increase the unit production. The unit production of soybeans in China was 1893 kg in 2002, and it decreased to 1653 kg in 2003. In 2004, 2005 and 2006, it was 1815 kg, 1705 kg and 1721 kg, respectively. The total production of soybeans in the USA in 2006 increased by 46% compared with the total production in 1992. The mechanizing production made the unit production increase from 39.2 bushel per acre in 1992 to 44.6 bushel per acre in 2006, rising by 14%. The USA has obvious comparative advantage in soybeans' production.

According to the theory of comparative advantage, the USA and other countries with abundant land resources should produce more soybeans, and the countries with shortage of land resources (i.e, China) should produce more labor-intensive crops. Under the condition of efficient use of domestic and international resources, and by adjusting the surplus of various countries through international trade, optimizing resources allocation can be achieved.

3.2 Importing Soybeans and Water Resources Importing

Freshwater is the source of grain production. As the development of industrial and agricultural production, there has been significant contradiction between the supply and demand of freshwater in China, which has severe influence on agriculture, especially the development of grain production.

According to the Freshwater Resources Status of Major Grain Producing Countries in the World from 2003 to 2007 issued by Food and Agriculture Organization of the United Nations, the total freshwater in China is 2829.049 billion cubic meters, which ranks fifth in the world, and accounts for 92.73% of the total freshwater of the USA and 97.49% of the total freshwater of Canada. However, the freshwater per person in China is only 2137 cubic meters, which accounts for 20.9% of the number of the USA, and less than 2.4% of the number of Canada. On one hand, the total freshwater of China is 13.9 times of that of France. On the other, the freshwater per person in China is less than 64% of that in France. That is to say, China is a country with relatively shortage of freshwater.



Source: FAO STAT Database (<http://www.fao.org/nr/water/aquastat/>)

Figure 2 Average of freshwater resources in major grain producing countries

The supplies of freshwater resources are closely related to the grain production and development. As per the current utilizing level of agricultural water resources, the rate of transformation of freshwater and food is: to produce one kg of wheat, 1.2 tons of water is needed; to produce one kg corn, less than 0.5 tons of water is needed. But the water consumption for producing soybeans is similar to the water consumption of rice, 2.3 to 2.6 kg of water per tons. The soybean needs more water than the other grains.

Table 5 Comparison of Water Consumption in Different Food Product

Food Category	Wheat	Rice	Corn	Potatoes	Soybean	Beef	Pork	Poultry
Water Consumption (L/ Kg)	1150	2656	450	160	2300	15977	5906	2828

Source: Yin Chengjie, *Food Security, Global Stability*, 2009, p.40.

The contradiction between the supply and demand of freshwater resources is one of the deep reasons for the grain supply shortage. On one hand, due to the progress of industrialization and urbanization, the freshwater resources consumption has been increased. On the other, the global warming and serious drought have resulted in the insufficient supplementary of freshwater, which further deepened the contradiction between the supply and demand. In the future, during the development of agriculture, those who can well protect freshwater resources will obtain abundant freshwater resources, achieve continuous development of grain production and guarantee the safety of the grain production. Therefore, it would be beneficial to moderately adjust the agricultural production structure and intentionally import grain and meat products with high water consumption. This would not only lead to better protection domestic freshwater resources, but also guarantee a continuous development of agricultural production by making efficient use of global resources.

3.3 Importing soybeans and importing agriculture subsidy of developed countries

Grain is a basic necessity with very low elasticity of demand. As a result in international political competition, grain is always seen as a strategic commodity related to national benefits. There is a high amount of agricultural subsidy in the USA, with the costs being transferred to agriculture in developing countries with negative affects on farmers’ benefits as a result.

In the past years, the American government gradually increased the subsidy to soybean production. In particular after the 2002 American Agriculture Law came into effect, the USA endorsed several subsidiary policies, for example, the subsidy for marketing loan, the subsidy for loan deficiency, direct subsidy and counter-cyclical subsidy. It is regulated by the WTO that the agricultural subsidy of each country should be limited to the level of 1992. In accordance with the estimation of Brazil Ministry of Agriculture, the soybean subsidy of America in 1992 was 120 million dollars, increasing to 2.5 billion dollars in 2001. Compared with this, in 2001, in China, the total agricultural subsidy was only 74.151 billion Yuan, (8.966 billion dollars). The soybean subsidies of the USA accounted for 28% of all the agricultural subsidies in China. After 2003, the central government increased the subsidy to agriculture. The total expenses for agriculture, farmer and rural area increased from ¥262.6 billion in

2004 to ¥431.8 billion in 2007, and it increased to 595.55 billion in 2008. However, the agricultural subsidies in China are far less than that in the USA. From 1998 to 2006, the total subsidy for soybeans in the USA was 14.239 billion dollars, with the direct subsidy of 2.979 billion dollars, accounting for 21% of the total subsidy.

In the predictable future, the huge agricultural subsidies and trade barriers in developed countries will remain for a long time, and will continue to distort the international grain price. Every coin has two sides. On one hand, the grain brought the price advantage to farmers in the exporting countries in international trade and did harm to the agricultural suppliers of the importing countries. On the other, subsidy brought the economic benefits to consumers in importing countries. Therefore, China importing soybeans from the USA can be regarded as Chinese consumers import the agricultural subsidy of the USA and increase the consumption benefits. Of course, the purpose for the U.S to subsidize the agricultural production is to increase its domestic employment, not for the Chinese consumers. Anyhow, in China, there are no economies of scale in soybean production. Without the advantage of governmental subsidy, importing soybeans are the second best choice.

4. Increasing the Income of Chinese Farmers

4.1 Increasing the Income of Chinese Farmers by Trade

There is scarcity of arable land and relatively little freshwater per person in China. In addition, during the economic development period, the government can only provide limited support to the capital and technology of agriculture. That is, to improve the income of Chinese farmers we should depend on our own advantage to make efforts to improve the land profits per unit area, rather than pursuing the optimization of unit labor profit (Xu Dianqing, 1997). China has abundant labor resources. China has its special comparative advantage in participating in world agriculture trade.

Suppose there are two crops, with their domestic production Q_1 and Q_2 , and the trade volume QT_1 and QT_2 . The domestic prices are P_1 and P_2 . The international prices are PT_1 and PT_2 . Before participating in trade, the profit of farmers is L_1 . then we have:

$$L_1 = P_1 \times Q_1 + P_2 \times Q_2 \tag{3}$$

Suppose during the trade, China imports QT_1 and exports QT_2 . In accordance with the domestic price, the profit after the trade is L_2 . Then

$$L_2 = P_1 \times (Q_1 + QT_1) + P_2 \times (Q_2 - QT_2) \tag{4}$$

If the agricultural products are exchanged with equivalent value, that is to say, the export value and the import value in international trade are the same.

$$\text{i.e. } PT_2 \times QT_2 = PT_1 \times QT_1 \tag{5}$$

The profit difference is:

$$L_2 - L_1 = P_1 \times QT_1 - P_2 \times QT_2 = \left(\frac{P_1 \times PT_2}{PT_1} - P_2 \right) \times QT_2 \tag{6}$$

According to the formula above, if

$$(L_2 - L_1) > 0 \Rightarrow \frac{PT_2}{PT_1} > \frac{P_2}{P_1} \text{ or } \frac{PT_2}{PT_1} \times \frac{P_1}{P_2} > 1 \tag{7}$$

The relative price between the exported products and imported products in domestic market is less than the relative price in international market, there will be profit in international trade. Suppose:

$$\alpha = \frac{PT_2}{PT_1} \times \frac{P_1}{P_2}, \text{ then } L_2 - L_1 = (\alpha - 1) \times (P_2 \cdot QT_2) \tag{8}$$

$(P_2 \cdot QT_2)$ is the value of agricultural product exported calculated by domestic price. α represents the coefficient between international relative price and domestic relative price. If $\alpha > 1$, there will be positive profit in international trade. The more the α , the more the profit in international trade will be.

Table 6 The Relative Price Between Soybean and Major Crop in Chinese Domestic Market

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Ave.
Rice	1.2	0.99	0.74	0.78	0.88	0.77	0.85	0.82	0.7	0.76	0.87	0.92	0.86

Wheat	0.63	0.54	0.43	0.43	0.47	0.4	0.43	0.43	0.38	0.39	0.44	0.43	0.45
Corn	0.59	0.46	0.34	0.41	0.42	0.36	0.44	0.43	0.38	0.35	0.37	0.39	0.41

Source: China Agricultural Statistics Yearbook

Table 7 The Corresponding Price Coefficient Between Soybean and Other Corps in 2006

	Rice	Wheat	Corn
α	1.44	1.97	1.34
δ	1.33	0.85	0.52

Note: δ indicated the relative price of soybean and other crops in international market in 2006

From Table 6 and 7, it is obvious that in the international market, the price of rice is more than 1.33 times the price of soybeans. But in domestic market, the annual average price of rice is only 86% of that of soybeans. In 2006, the unit production of rice was 6 232 kg/hectare, and the unit production of soybeans was 1 721 kg/hectare. If we plant one hectares of rice instead of one hectares of soybeans, and we carry on the international trade, i.e. exporting rice and importing soybeans, then one hectare of rice can exchange 8 259.8 kg of soybeans, which is 6 538.8 kg more than the unit production of soybeans of 1 721 kg/hectare, or equivalent to about 22,000 Yuan. That is to say, with the special land resources and no restrictions on external conditions, the farmers should change planting soybeans to planting rice, and thus get the higher revenue by international trade.

Similarly, if the farmers plant corn and wheat instead of planting soybeans on the same land, their income will be increased by 7 060.6 Yuan and 3 561.7 Yuan per hectare, respectively. In international market, although the prices of corn and wheat are less than the price of soybeans (in domestic market, there are more price differences.), producing corn and wheat instead of producing soybeans are still profitable. Since the α of rice, wheat and corn are more than 1 (α represents the coefficient between international relative price and domestic relative price.), by planting other crops to increase export and importing soybeans, the income of Chinese farmers can rise.

4.2 Increasing farmers’ income by adjusting agricultural production structure

The costs and revenues of soybeans are worse than the average level of the three major grains, and are much lower than that of oil crops and economic crops.

Table 8 The Cost and Earnings Between Different Corp in 2008

Mu	Three Major Grain	Soybean	Peanut	Rapeseed	Flue-cured tobacco	Beet
Production (Kg)	436.6	139.7	220.5	134.9	147.9	3318.3
Value (Yuan)	748.8	526.4	933.5	702.1	2040.1	1102.1
Cost (Yuan)	562.4	347.9	677.1	393.6	1720.8	738.9
Net income (Yuan)	186.4	178.5	256.4	308.5	319.2	363.2
Labor consumption (days)	7.7	3.9	10.7	8.7	35.8	8.1
Sale price (50 kg/Yuan)	83.5	184.3	208.2	256.7	686.9	16.4

Source: Compilation of the National Agricultural Costs and Returns 2009, p.64

The North-east is the major soybean production area in China, with an annual average production more than 40% of the national production. The soil feature of the North-East plain is mostly humus, with acid character. It is not only suitable for planting grain plants such as corn, broomcorn, rice and wheat, but also suitable for planting economic crops and oil crops such as beet and tobacco. From Table 8, it is shown that compared with planting soybeans, planting oil crops and economic crops are of higher profits per mu. The net profits per mu of flue-cured tobacco, beet and rapeseed are 1.79 times, 2.03 times and 1.73 times of net profits per mu from planting soybeans. Apart from this, the labor consumption per mu of planting grain plants, economic crops such as flue-cured tobacco and beet as well as oil crops such as peanuts and rapeseed is much higher than the labor consumption per mu of planting soybeans. Soybeans are non-labor-intensive crop, which are not suitable to do mass production in China,

with respect to the basic situation of large population, little land, low technology and lack of capital. Moderately adjusting the production structure of domestic agricultural products, decrease the proportion of domestic soybeans, decrease the planting areas of soybeans, and change these areas to plant economic crops with better economic benefits such as flue-cured tobacco and beet, would lead to significantly higher income of farmers, and also benefit to relieve the remaining rural labor force problem in China.

5. Summary

Taking soybeans as an example, we examined the impact of fully utilizing domestic and international resources and markets on farmers' income. We show that by moderately adjusting the agricultural structure in China, making better use of Chinese farmers' comparative advantage, farmers' income can improve significantly.

First, shortage of arable land is a fact in China and it determines that the target of agricultural production in China should not be to optimize the profit of unit labor, but to optimize the profit of unit land area. Soybeans belong to land-resources crop, with little labor consumption per unit land and less profit than other economic crops, thus it has no comparative advantages in production. Second, there is lots of freshwater reserve in China, but the reserve per person is very low. Moderate importing of soybeans is benefit for protecting the freshwater resources in China and can safeguards the long-term development of major grain production in China. Third, the high agricultural subsidies in the U.S., Canada and EU., countries has seriously distorted the world agricultural production. Although it to some extent destroyed the incentives of Chinese farmers to plant soybeans, it made the consumers in importing countries obtain the American agricultural subsidy as well, thus improving consumers' benefits. Fourth, soybeans belong to land-intensive products, and the costs and benefits are worse than beet and flue-cured tobacco. By moderately adjusting the planting structure of soybeans and change some of the soybean arable land into arable land for planting economic plants, this can to some extent improve the income of soybean farmers.

Either from the perspective of resources or from the perspective of costs and benefits, soybean planting does not have comparative advantage in China. China can fully consider that with the conditions of domestic and foreign resources and two markets, based on some scale of soybean production, moderately decrease the proportion of domestic produced soybeans, and change the arable land for soybeans as the arable land for other economic plants with better revenues as a result. In doing so, the income of farmers can be increased and remaining rural labor force problem can be resolved to some extent. Also, based on safeguarding the national grain safety, China can reasonably adjust the agricultural production structure in accordance with the national situation, and to promote the continuous development of agriculture in China.

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